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**United States Patent** [19]**McEwen**[11] **Patent Number:** **5,352,195**[45] **Date of Patent:** \* **Oct. 4, 1994**[54] **APPARATUS FOR INTRAVENOUS  
REGIONAL ANESTHESIA**5,181,522 1/1993 McEwen ..... 606/203  
5,254,087 10/1993 McEwen ..... 604/66[75] **Inventor:** **James A. McEwen**, Richmond,  
Canada[73] **Assignee:** **IVRA Systems, Inc.**, Vancouver,  
Canada[\*] **Notice:** The portion of the term of this patent  
subsequent to Oct. 19, 2010 has been  
disclaimed.[21] **Appl. No.:** **935,785**[22] **Filed:** **Aug. 27, 1992****Related U.S. Application Data**[63] Continuation-in-part of Ser. No. 471,514, Jan. 29, 1990,  
Pat. No. 5,254,087.[51] **Int. Cl.<sup>5</sup>** ..... **A61M 31/00**[52] **U.S. Cl.** ..... **604/66; 606/202;**  
128/677; 128/DIG. 12[58] **Field of Search** ..... 604/30, 31, 65-67;  
606/201-203; 128/677, 686, 783, 744, DIG. 12,  
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Campbell Leigh & Winston[57] **ABSTRACT**

Apparatus for assisting in the administration of anesthesia in a portion of a patient's limb distal to a cuff comprises in combination: applied pressure transducing means for generating an applied pressure signal representative of a pressure applied to a limb by a cuff which encircles the limb and applies pressure to the limb; anesthetic pressure sensing means for sensing the pressure of anesthetic liquid in a vein distal to the cuff and for generating an anesthetic liquid pressure signal indicative of the pressure; and alarm means for producing an alarm signal when the difference between the pressures corresponding to the applied pressure signal and the anesthetic liquid pressure signal is less than a preassigned safety limit. The apparatus may include anesthetic control means responsive to the alarm signal for stopping the introduction of anesthetic liquid when the difference is less than a preassigned limit, anesthetic concentration sensing means for estimating the concentration of anesthetic liquid in the blood, and anesthetic level estimation means for estimating the level of anesthesia in the portion of the limb distal to the cuff.

**18 Claims, 1 Drawing Sheet**